Title:
Urbanisation, dietary change and traditional food practices in Indonesia: a longitudinal analysis

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Highlights

- Limited evidence of shift to “Western” dietary patterns for 13 Indonesian provinces (1993-2015)
- Little or no change in expenditures for foods associated with the local traditional diet
- Urban residence not associated with “Western” dietary patterns except for Jakarta
- Pace of change similar in urban and rural areas; faster in rural areas for some foods
- Traditional food practices (self-production, transfers) retained in both urban and rural areas

Abstract

The nutrition transition hypothesis poses that as low-and-middle-income countries (LMICs) become wealthier and more urbanised, they experience a shift in dietary consumption towards 'Western' diets high in sugars, fats, animal-source foods, processed and packaged products. This paper uses panel data covering a period of 23 years to examine how changes in the urban environment relate to food expenditures, dietary diversity and traditional practices (food self-production and sharing) in Indonesia, a country that has experienced rapid economic growth and urbanisation over the last few decades. We first examine trends separately for urban and rural areas, and then use fixed effect models to examine whether changes in urban residence is associated with changes in food expenditures, traditional practices, and overall dietary diversity. Results show that, despite some increases in acquisitions of animal-source foods and of packaged and ready-made foods, budget allocations for other food groups has remained constant, and that changes have largely occurred in parallel across urban and rural areas. In turn, traditional diets high in cereal and plant products, as well as traditional food practices continue to be dominant in both rural and urban areas, despite the context of rapid socio-economic change and urbanisation. Fixed effect regression suggests that transition from rural to urban residence is not significantly associated with changes in food expenditures for any of the outcomes examined. On the other hand, there is some evidence that moving specifically to Jakarta is associated with some change towards 'Western' food preferences.

Keywords: Indonesia; urban; diet; nutrition; food system; dietary change; traditional diet

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1. Introduction

Global shifts in dietary patterns occurred from mid-20th century onwards have been closely associated with a concurrent rise in the global prevalence of chronic, non-communicable disease. Poor diet is, by some accounts, the leading risk factor for death and disability worldwide (GBD, 2015). Low and middle-income countries (LMICs) in the South face particular challenges. Rising incomes, falling poverty rates and the increased availability of and access to a broader range of foods have contributed significantly to reducing the burden of hunger and disease resulting from under-nutrition in LMICs (Kearney, 2010). At the same time, more recently it has been suggested that, in the South, a double burden of disease from infectious and chronic illnesses (WHO, 2017)— and a triple burden of malnutrition (Gómez et al. 2013) as undernourishment and micronutrient deficiencies coexist with overweight and obesity, are now increasingly common.

The "nutrition transition"—a narrative to explain the dynamics behind global dietary change first theorised by Popkin (1993), ascribes much of the rise in poor, diet-related health outcomes to a global shift towards dietary patterns characterised by higher intakes of calories, fats, sugars and salt; reduced intakes of whole grains, vegetables and fruits; and an overall increase in the consumption of ready-made, (ultra-)processed foods. According to this narrative, the shift towards such diets, coupled with reduced levels of physical activity, accounts for much of the observed increase in the burden of non-communicable diseases. An additional aetiological factor is urbanisation, considered to be one of the key macro-level drivers of global dietary change (Popkin, 1993; 1999; 2013). The pathways through which urban living impacts diets are numerous and complex. These include, for example, increased rates of participation in the labour market, which favours a shift in preference towards convenience over quality in food choices (Pingali, 2006; Raschke and Cheema, 2008); a reduction in access to local food resources, including from self-production (Smith, 2013); increased income levels, which enable purchases of a broader range foods—including potentially less nutritious ones (Kearney, 2010); and higher availability, in cities, of unhealthy packaged and processed foods (Cockx, Colen and De Weerdt, 2018). In spite of the weight attributed to urbanisation in the process of global dietary change, and of the increased attention to the South as the epicentre of diet-related public health challenges, literature studying the actual impacts of urban living on diets in the South is still limited.

This article contributes to the existing literature on dietary change in the Global South in two ways. First, the study provides an original analysis of the evolution of budget allocations trends for different food groups in Indonesia over the past two decades, focusing specifically on differences between urban residents—who may have experienced faster changes in their local food environments, for example due to an increased availability of Western-style food products and retailers—and their rural counterparts. To do so, the paper draws on panel data derived from the Indonesia Family Life Survey (IFLS), and uses fixed effect models to isolate the impact of transitions to urban residence on dietary changes. While some studies have examined dietary changes in Indonesia (e.g. Roemling and Qaim, 2012; Hanandita and Tampubolon, 2015), these either cover a short time period; do not focus on changing food preferences over time; or do not examine the role of urban residence as the main predictor of change. By examining households who moved from rural to urban areas using longitudinal data, we are able to better isolate the potential effect of urban environments on dietary changes. This study seeks to complement and expand on previous investigations available for the country and, more broadly, to contribute to existing literature on global dietary change with a case study from an under-studied region, Southeast Asia.

Second, this paper makes a new contribution to the literature by examining changes in two practices—self-production and sharing of food outside the household—which might point to persistence of food traditions typically associated with rural lifestyles, amidst Indonesia's fast pace of urbanisation. This study may also help inform policies that seek to tackle dietary change, by identifying how food practices change in response to exposure to urban environments.

2. Literature review

Global dietary change, urban environments and diets in the South

A substantial body of literature exists exploring changes in dietary patterns across continents and within countries and framed according to the shifts set out in the nutrition transition model (e.g. Kearney, 2010, Kimokoti, Fung & Millen, 2013; Popkin, 2013 at the global level; Baker and Friel, 2014, for Southeast Asia; and Roemling and Quaim, 2012, for Indonesia). These studies do indeed point to some commonalities in dietary change including, for example, an overall increase in per capita calories consumption, and a stagnant or decreased consumption of coarse grains (Kearney, 2010; Popkin, 2013). However, despite this (albeit limited) evidence of geographical variations in nutritional change, only a handful of accounts actually problematize either the model itself or investigate the nature and drivers of change in specific countries of the South. This results in an overall lack of analytical explanations of *how* change has taken place across countries (Winson and Choi, 2017) and why these processes may differ.

Studies examining the effect of urban environments on diets at the city or neighbourhood scale are largely focused on high-income countries. This body of research builds on the concept of “food desert” (Cummins and Macintyre, 2002), indicating areas with poor access to nutritious food outlets, to link the presence or absence of specific retailers in the local food environment with individual dietary choices (e.g. relating presence of fast food joints and supermarkets to worse and better health outcomes) (Cannuscio et al., 2014). However, research on the theme shows mixed, rather than consistent patterns of connection between proximity to food outlets, choice of food retailers and eating patterns. For example, in their systematic review of the literature on food environments and diets, Caspi et al. (2012, p. 1181) “found moderate evidence in support of the causal hypothesis that neighborhood food environments influence dietary health”. The validity of associations made between patronage of specific food outlets and particular dietary outcomes has also proven inconsistent. For example, the presence of supermarkets in an area is often considered a proxy for higher availability of healthy fresh produce to locals. However, studies have shown mixed results in nutritional terms from patronage of supermarkets, possibly because among the broader variety of foods they offer are many packaged, ultra-processed, nutritionally-poor products (Caspi et al. 2012; Toiba et al., 2015).

Even bigger problems arise when trying to uncritically apply such proxies to study urban environments and dietary change in cities of LMICs. Such cities often have more diverse food systems, where a larger number of (formal and informal) actors coexist, which in turn problematizes assumptions about availability and access. More traditional and informal types of retailers – wet markets, street vendors and small, family-owned shops – still play a major role in the urban food economy (Tschirley, 2007; Battersby and Crush, 2016). For example, using case studies from Vietnam and India, Crush (2014) showed how consumers secure food from numerous outlets and that, while supermarkets in some cases offered cheaper fresh produce, other factors—including the possibility to negotiate prices and buy smaller (more affordable) quantities—drove instead consumers towards informal actors. Also in the case of countries with a longer history of supermarket penetration, such as Indonesia, the urban food economy does not seem doomed to disappear; “on the contrary, rapid urbanisation, the growth of poor urban populations, and the growth of informality (not just in the food sector) as an entrepreneurial rather than survival strategy, all suggest that the formal and informal food economies will compete, complement and coexist long into the future” (Crush, 2014, p. 550).

A second factor that makes it difficult to translate evidence from high-income countries to LMICs is the fact that, in the latter, boundaries between rural and urban areas are often less marked, both physically—with stronger connections between periurban and rural hinterlands to the city core, for example in terms of food exchanges—and metaphorically, with the lifestyle of many urban dwellers still retaining features more typically associated with rural areas. Such a phenomenon is well-documented, in Indonesia, in *kampung* (“village”) areas, settlements physically located in cities that preserve a more typically rural sense of communality, cohesiveness and cooperation (Rahmi, Wibisono, and Setiawan, 2001; Guinness, 2009). This can have a direct and concrete impact on food-related habits and practices. Indeed, it has been suggested that “the very notion that there is a clear rural/urban distinction in economic activities or cultural norms is difficult to maintain” (McGranahan and Satterthwaite, 2014, p. 6) and that, on the contrary, rural-urban linkages tend to persist as “many families span the rural/urban divide as part of their livelihood strategies (Tacoli, 2006, as cited in McGranahan and Satterthwaite, 2014, p. 17). The importance, for food and nutrition security, of social connections, support networks and interactions revolving around food—such as transferring it outside of the household, receiving it as a gift, and consuming it in communal settings—has been documented, especially within vulnerable populations, who may lack access to the higher variety of foods available in the urban environment (Dounias et al., 2007). Indeed, a large body of anthropological literature exists that documents the numerous social meanings of food and food-related practices, beyond the mechanical act of feeding oneself (an excellent overview of which is presented in Mintz and Du Bois, 2002).

The evidence presented suggests that it is timely to look further into the peculiar shapes that the nutrition transition has taken across LMICs. Moreover, in so doing, it is necessary to critically rethink some of the assumptions underlying the model itself, as well as the hypotheses proposed to explain the role of urban living in the process of dietary change. We expect that, in Indonesia as in other LMICs, diets will have experienced some of the changes posited by the nutrition transition narrative, for example increased consumption of packaged products and ready-made meals. However, we hypothesize that, due to the heterogeneity in local urban food systems; the resilience of local food cultures and practices; and specific characteristics of the local diet (discussed briefly in the following section), change will have taken unique shapes, that are worth investigating, to move beyond the often unchallenged hypothesis of a uniform shift, in LMICs, towards “Western” diets.

Indonesian context

Relatively little literature on dietary change and urban living is available for Indonesia. Yet, the country represents an excellent case to study the interaction between socio-economic change and the evolution of dietary patterns. First, Indonesia is the fourth most populous country in the world and, between 1990-2014, among the ten fastest urbanizing (UN DESA, 2015), which in turn makes it likely that significant socio-economic change has taken place at a fast pace. Meanwhile, some traditional elements of the local diet are likely to have mediated dietary change as posited by the nutrition transition narrative. It is difficult to speak of a single Indonesian diet, considering the geographical extension and cultural diversity present in the country. However, for example, the popularity of plant-source foods such as tofu and tempeh—soy bean-derived daily staples, which represent a cheaper alternative to meat and are key ingredients of numerous local dishes—may have influenced the extent of change in consumption of animal-source products. Second, while remarkable progress has been made in the country against many socio-economic indicators, including economic growth, life expectancy, education and poverty rates (World Bank, 2014), malnutrition is still widespread, both in the form of under-nutrition and, increasingly, of over-nutrition. The prevalence of overweight has increased among adults of all age groups (WFP, 2018) and, over the past 15 years, obesity has risen to 5 and 9% of the male and female population respectively (WHO, 2018). Over- and under-nutrition have been shown not to be clustered within the same geographical areas; generally, over-nutrition is still more of a concern for wealthier groups, while under-nutrition for poorer ones (Hanandita and Tampubolon, 2015), in line with findings from other studies focusing on LMICs (e.g. Corsi, Finlay and Subramanian, 2011). Nevertheless, empirical investigations of over-nutrition outcomes—such as that of Roemling and Qaim (2012)—

point to an increased occurrence of overweight and obesity in the country, interestingly, in both urban and rural populations, and across socio-economic gradients. A review article on overweight and obesity in Indonesia identified a positive association between urban residence and risk of occurrence of overweight or obesity in one study targeting adolescent girls, and two others looking at adults (Rachmi, Li and Baur, 2017). Third, while some studies are available that connect dietary choices with patronage of different food retail types, these have shown mixed results. Anggraini *et al.* (2016) study food outlets in urban slums of Jakarta, including street food vendors, small shops (*warung*) that offer snacks, beverages and some non-perishable items such as flour and sugar; small cafes (*warung makan*) that instead provide more substantial meals; traditional markets and street sellers providing raw foods and, finally, modern retail outlets, such as supermarkets and convenience shops. Their findings highlight that, in poor areas of Jakarta, residents have access within walking distance—and tend to shop frequently—in stores that offer energy-dense foods of poor nutritional quality. While the population studied met the government-issued dietary guidelines in terms of consumption of staples, plant and animal proteins, they did not meet the suggested intake of fruits and vegetables and showed a high share (35%) of daily dietary intake from snacks, mixed dishes and sugary beverages. Higher fruit consumption was instead associated with modern type food retailers, but not with socio-economic status. Toiba *et al.* (2015), focus instead on the dietary implications of supermarket penetration in three mid-sized Indonesian cities, presenting somewhat contrasting results, showing a significant negative correlation between dietary quality and patronage of supermarkets. The combination of factors outlined above suggests that the implications of urban residence on food choices in Indonesia are not straightforward, and are worthy of the further investigation set out below.

3. Methodology

Sample description

The sample employed in this study is derived from the Indonesia Family Life Survey (IFLS), a multi-purpose socio-economic study administered by the RAND Corporation. IFLS is the only large-scale longitudinal survey available for Indonesia. At the time of the first survey wave (1992-93), the sample was representative of 83% of the country's population (https://www.rand.org/labor/FLS/IFLS.html).

All the five IFLS waves available to date are employed in this study, covering a 23-year period (1993-2015) and a sample of individuals (N= 8,486) living across 13 of the country's provinces. The sample considered in this article (N= 8,486) represents 38.5 % of the 22,019 individuals included in the baseline IFLS 1 sample and 49.1% of the 17,295 individuals found alive in all survey waves. Table 1 presents summary descriptive statistics of the sample.

Table 1. Panel descriptive statistics (N=8,486).

The IFLS collects information on food acquisitions at the household level. However, this study uses individuals as the unit of analysis, to account for person-specific differences (for example, sex and educational level) within and across households. The sample was selected based on the following criteria (Figure 1): only those individuals that had information on food acquisitions in all five waves were considered, to increase the likelihood that changes in food preferences, represented by acquisitions across food groups, which are likely to develop or change over relatively long periods of time, could be captured; participants with no, or duplicate unique individual identifiers were excluded; individuals for which no indication of urban/rural residence—an essential piece of information for the study—was available, were excluded; finally, observations related to individuals that, from the third survey wave onwards, had moved to newly-created provinces, outside the 13 original ones, were excluded. Combined, 1,875 individuals (15.7% of all those having interviews in the five survey waves) were excluded because of missing data either related to food acquisitions or to urban/rural residence. This represents a limitation, and is further discussed in the closing of the article.

Figure 1. Flow chart of sample selection

Measures of change in food preferences

IFLS collects information on purchase and self-production or acquisition through other sources, such as transfers (henceforth abbreviated to “self-production”) of 37 different food items. Information is usually gathered from the female head of the household, who is asked to estimate the value in Indonesian Rupiah (IDR) of each food item purchased, or the equivalent value if self-produced, over the preceding week. Information on the total estimated monetary value of food transfers to people outside the household over the preceding week is also collected.

Based on the existing literature, to identify whether changes in food preferences predicted by the nutrition transition hypothesis occurred, we study 13 food items across the following five analytical categories: (a) fats and animal foods; (b) packaged foods and ready-made meals; (c) salt and sugar; (d) staple foods and (e) other plant-foods. We sum reported purchase and self-production (in monetary terms) of all foods within each group, to then calculate shares over reported total weekly food acquisitions. Food expenditure information is used as a proxy to understand potential shifts in food preferences. While this is a strong assumption, existing studies suggest that food expenditures match reasonably well food actually consumed by individual respondents; in some instances, expenditure information has been used to study even individual nutrition outcomes (see for example Humphries *et al.*, 2017). As our study aims instead to understand broader shifts in food preferences, we argue that food expenditure data is a reliable proxy for the purpose.

Changes in overall dietary diversity are also considered. The rationale for this is that a key suggested positive dietary outcome of increased levels of urbanisation and socio-economic development is the higher quantity and variety of foods available to consumers. We construct household dietary diversity scores (HDDS), based on reported acquisition (1 if acquired, 0 if not) over the previous week, either through purchase or self-production, of 22 food items: rice, corn, sago, cassava, other staples, vegetables, beans, fruits, dried foods (e.g. noodles, cookies, bread); meat and fish (beef, chicken, fresh fish, processed fish); side dishes (animal- and plant-source); eggs and milk; spices (oils and butter); prepared meals (consumed at, or away from home). The use of HDDS as measures of dietary quality—as opposed to indicators of *access* to a diverse diet—is debated, particularly because there is limited evidence validating the link between HDDS and quality in nutritional terms (see the extensive review articles by Jones *et al.*, 2013 and Leroy *et al.*, 2015). Nevertheless, for the purpose of this study, which looks at broader changes in dietary diversity rather than specific nutritional outcomes or individual nutrient intake, the

HDDS is considered a reliable proxy, as it is generally agreed that to more diverse diets corresponds a better nutritional status, and consequently better health outcomes. Some IFLS items were excluded in this study: beverages (water, coffee, tea and cocoa), which have little or no nutritional value *per se*, and whose nutritional value if consumed for example with sugar or honey cannot be discerned from information available; condiments (soy, shrimp and chilli sauce; sugar, salt) which, by definition, are usually not used in large amounts; alcoholic beverages, rarely consumed by the largely-Muslim Indonesian population; and two non-food items, betel nut and tobacco products. As increased availability of a broader number of food items can also impact negatively diets, due for example to increased purchases of nutritionally-poor packaged foods and soft drinks, we excluded from the HDDS those foods which are usually not recommended as part of a healthy diet (e.g. sugar and soft drinks). This follows what has been done by other researchers interested in capturing dietary diversity within the limits of a “healthy diet” (see e.g. Bezerra and Sichieri, 2011). Although IFLS does not capture information on their composition, prepared meals consumed at home or outside were included in the HDDS, in recognition of the fact that these are consumed increasingly frequently in cities of the South, and may sometimes represent most of the daily food intake of an individual or household (Van Esterik, 2008).

It is important to note that, while information on food purchased and self-produced is available throughout IFLS, the first wave presents a different structure from the others. To ensure consistency, information in IFLS 1 that was not safely comparable to that reported in subsequent waves was excluded from the analyses.

Measures of traditional food practices

The term “traditional” is hereby used to indicate practices and behaviours related to food that are usually more commonly found in rural environments, and that are expected to disappear as socio-economic change (including due to urbanisation) progresses. This study considers two traditional practices. First, we look at food self-production, measured as the share of food that households report as self-produced or acquired through transfers, over the total weekly food acquisitions. The rationale behind this is that the more food is self-produced in the urban areas studied, the more likely it is that traditional practices and knowledge associated with food preparation are preserved. Second, we study food transfers, measured as the weekly absolute value in Indonesian rupiah of food given to people outside the household. Existing literature indicates that food has an important role in traditional social and religious functions, and in consolidating the sense of identity and place of countries, regions and communities (Mintz and Du Bois, 2002). While IFLS only collects estimates on the monetary value of food transfers—and not, for example on specific foods shared, or the reasons why—data available can help test the hypothesized retention of traditional food practices amidst increasing levels of urbanisation and socio-economic change in the country.

Socio-economic variables

The main independent variable considered in this study is urban residence, captured in IFLS by a dummy variable indicating whether a household resides in an urban or rural area. In IFLS, the distinction is based on the standard Indonesian Bureau of Statistics classification, which uses multiple indicators (for example population density and share of population in agriculture) to classify an administrative unit as urban or rural. To account for the peculiar urban nature of the Indonesian megacity capital, Jakarta, with respect to other, smaller, urban conglomerates, we recoded the urban/rural dummy to indicate whether a respondent resides in a rural area; in an urban area other than Jakarta; or in Jakarta. Other socio-economic variables considered are: gender, age, household size (normalised by dividing values by their squared root), marital status (recoded as a dummy variable, indicating whether presently married or not), education levels (recoded to capture whether respondent has no formal education; primary education; secondary education; tertiary education) and employment (recoded as a dummy variable indicating whether presently employed or not).

We did not use inverse probability weights available in IFLS to correct for attrition in the regression analyses, to avoid adding additional assumptions to the models. Sensitivity analyses conducted using both attrition correction weights and sample design weights, detected no instance of substantial change, i.e. change in the direction and/or significance, for the variables of interest. Where reported, monetary amounts in Indonesian rupiah were adjusted using the Organization for Economic Cooperation and Development's Current Price Index (https://data.oecd.org/price/inflation-cpi.htm). However, in the descriptive and regression analyses we use shares of foods acquired over total weekly acquisitions (including both food purchased and self-produced), rather than absolute monetary amounts. This was done to avoid possible bias resulting from changes in price structure over the time period considered, as no information on individual food prices is available that dates back to the 1990s; and as price indexes, even when available, may not be representative of smaller urban centres and rural regions. Data analysis was carried out using Stata, version 13.0.

Methods of analysis

Descriptive trends and linear regression

We look, first, at raw trends of change over time in expenditure shares for selected food items; proportion of food self-produced over total; and absolute value in IDR of food transfers outside the household. We then analyse confounder-adjusted shares derived from logit models featuring, as dependent variables, dummies indicating whether individuals acquired or not different foods, regardless of the amounts, and reported or not food self-production and food transfers; as the main independent variable an interaction term between the urban/rural dummy and the survey year (entered as a categorical variable); and, as additional explanatory variables, age (entered as a continuous variable), sex (dummy for female or male), marital status (dummy for married or not), employment status (dummy for employed or not) and household size (entered as a continuous variable).

Following this, we employ OLS regression to investigate significance of changes over time:

$$y_i = \beta_0 + \beta Time_i + \beta UrbTime_i + \beta_j X_{ij} + e_i$$

Where y_i represents the outcome studied (either the HHDS, food expenditure shares, or traditional practices) for individual i $(i = 1, \ldots, n)$; $\beta\mathrm{Time_i}$ the effect of time, which we input as a linear trend; $\beta\mathrm{UrbTime_i}$ the interaction between the main explanatory variable (urban/rural residence) and time effect; $\beta_j X_{ij}$ the control variables employed; and e_i the random error term. We cluster robust standard errors by household and province, to account for correlation between individuals living within the same family and geographical area.

Fixed effects models.

Individual fixed effects models were used to assess the relationship between urban residence and food acquisitions. Using fixed effects on panel data allows to reduce potential bias due to unobserved heterogeneity, and to isolate the effect of time-variant independent variable of interest (urban residence in this case) from time-invariant ones, such as gender. A robust Hausman specification test informed the use of fixed over random effects regression. The model employed looks as follows:

$$y_{it} = \alpha_i + \beta Urb_{it} + \beta Year_{it} + \beta_1 X_{it} + u_{it}$$

where y_{it} represents, for individual i $(i = 1, \dots, n)$ at time t, the outcome of interest; α_i represents the unobserved, time-invariant effect for individual i; βUrb_{it} is a dummy for urban residence, the main independent variable; $\beta Year_{it}$ indicates each of the five survey years (entered as dummies); X_{it} represents a vector of time-varying control variables, including marital status and household size; and u_{it} is the error term. Robust standard errors were clustered by province and household. The model estimates the impact of change in urban/rural residence for individuals who either moved between these two states, or whose place of residence changed from being classified as rural or urban. Thus, these models study change by using individuals as their own comparison, and only employing individuals who experienced a change in residence for estimation.

4. Results

Time trends and OLS model

Changes in food expenditures and dietary diversity

Figure 2 shows average HDDS; unadjusted average expenditure shares for different foods; average proportion of food self-produced over total food acquired; and value of food transfers outside the household. Figure 3 presents confounder-adjusted shares of individuals reporting purchase and/or self-production of different foods; and of individuals reporting food self-production and transfers. Data is presented separately for urban/rural residents. Table 1 presents OLS regression results for the same outcomes, employing urban/rural residence and year trend as the main independent variables.

Average HDDS scores increased between 1997 and 2007 and are consistently higher for urban residents than rural ones. The year trend is confirmed by OLS regression coefficients, which show a significant overall positive trend (0.1; SE: 0.01; $p<0.001$); the interaction term points to a greater extent of change in urban areas compared to rural ones (non-Jakarta urban areas: 0.65; SE: 0.1; $p<0.001$; Jakarta: 1.3; SE 0.2; $p<0.001$).

A higher share of rural residents (87%) reports rice acquisition compared to urban ones (73%). Urban residence is associated with a small decrease in expenditure shares for rice over time (non-Jakarta urban areas: -0.05; SE: 0.003; $p<0.001$; Jakarta: -0.1; SE: 0.02; $p<0.001$) and the interaction term shows a slightly higher degree of change over time (non-Jakarta urban areas: 0.003; SE: 0.0003; p<0.001; Jakarta: 0.003; SE:0.001; p<0.001). Shares of individuals reporting non-rice staples acquisition are instead similar for urban and rural residents by 2015 and, while time trend is significant (-0.0004; SE: 0.0001; p<0.001), the very small coefficient suggests little variation over time. Urban residence is also significantly associated with lower expenditure shares for non-rice staples (non-Jakarta urban areas: -0.01; SE: 0.001; p<0.001; Jakarta: -0.01; SE: 0.003; p<0.001). The share of individuals reporting acquisition of vegetables (including beans and plant-source side dishes) is consistently high throughout the survey waves, and increased slightly over time for urban and rural respondents, to reach, by 2015, 96 and 98% respectively). OLS regression shows significant effect of urban residence on vegetables acquisition (non-Jakarta urban areas: 0.004; SE: 0.001; p=0.003; Jakarta: 0.01; SE: 0.003; p=0.002); however, the year trend suggests a significant—albeit only slightly slower—pace of change for urban residents than rural ones (non-Jakarta urban areas: -0.001; SE: 0.0002; p<0.01; Jakarta: -0.003; SE: 0.0004; p<0.001). The proportion of individuals reporting fruits acquisition increased over time, as confirmed by the small, but positive effect of time trend (0.001; SE: 0.0001; p<0.001); urban residence is positively associated with higher expenditure shares for fruits (non-Jakarta urban areas: 0.01; SE: 0.001; p=0.003; Jakarta: 0.02; SE: 0.002; p<0.001) but, while the interaction term is significant (non-Jakarta urban areas: -0.0003; SE: 0.0001; p<0.001; Jakarta: -0.001; SE: 0.0003; p<0.001), the very small coefficient suggests in fact little difference in the pace of change over time between urban and rural areas.

Urban residence is significantly associated with higher expenditure shares for meat (non-Jakarta urban areas: 0.01; SE: 0.002; p<0.001; Jakarta: 0.03; SE: 0.004; p<0.001). A higher share of urban residents reports acquisition of milk and eggs throughout the five waves, but change has been slower in urban areas than rural ones. The interaction term is small but significant in this sense for milk, in both non-Jakarta urban areas (-0.001; SE: 0.0001; $p<0.001$) and Jakarta (-0.001; SE: 0.0002; $p<0.001$). Reported acquisition of fish is instead consistently higher for rural residents, and OLS regression shows that urban residence is significantly associated with lower expenditure shares for fish (non-Jakarta urban areas: -0.01; SE: 0.002; $p<0.001$; Jakarta: -0.03; SE: 0.003; $p<0.001$). Urban residence is also associated with slightly higher expenditure shares for butter (non-Jakarta urban areas: 0.001; SE: 0.0001; $p<0.001$; Jakarta: 0.002; SE: 0.0003; $p<0.001$), but lower expenditure shares for cooking oils (non-Jakarta urban areas and Jakarta: -0.01; SE: 0.001; $p<0.001$).

Reported acquisition of packaged and prepared foods increased in rural and urban areas, reaching similar levels by 2015, when around 90% of both urban and rural residents reporting acquisition of packaged foods; and 80% and 70% of prepared foods in urban and rural areas respectively. OLS regression shows a small but significant positive time trend on packaged foods acquisition (0.001; SE: 0.0001; $p<0.001$); while the interaction term suggests a significant, smaller extent of change in non-Jakarta urban areas (-0.001; SE: 0.0001; $p<0.001$), the small coefficient suggest that change over time might not have differed substantially between rural and urban areas. OLS regression coefficients are significant for ready-made foods, suggesting moderate yearly increases (0.003; SE: 0.0002; $p<0.001$), and a positive association with urban residence (non-Jakarta urban areas: 0.04; SE: 0.002; $p<0.001$; Jakarta: 0.07; SE: 0.01; $p<0.001$). Shares of individuals reporting soft drinks acquisition did not increase over time in urban nor rural areas; a significant association—larger in magnitude for Jakarta residents— exists between urban residence and expenditure shares for soft drinks (non-Jakarta urban areas: 0.002; SE: 0.0003; p<0.001; Jakarta: 0.01; SE: 0.001; p<0.001).

Figure 2. Average household dietary diversity Score (HDDS) and unadjusted shares of expenditure by food groups (N=8,486).

Figure 3. Confounder-adjusted proportions of individuals reporting purchase and/or self-production of different foods (N=8,486).

Table 2. Results of the OLS regression of urban residence, year trend, and different food variables.

Retention of traditional practices

Descriptive trends, and results from OLS regression for the two traditional practices studied are presented in Figure 2 and 3; and Table 1 respectively. Food self-production is consistently higher for rural than urban residents. By 2015, around 17% (urban residents) and 26% (rural residents) of weekly food acquisitions were obtained through self-production or transfers. OLS regression coefficients show a significant negative effect of urban residence on self-production (non-Jakarta urban areas: -0.1; SE: 0.004; $p<0.001$; Jakarta: -0.1; SE: 0.01; $p<0.001$). Raw trends show that food transfers outside the household are similar for urban and rural respondents, with slightly higher absolute values in IDR for the former; regression coefficients are not significant in this sense. There is instead a significant positive association between time trend and food transfers value (+708.2; SE: 56.3; $p<0.001$).

Fixed effect models

Results of fixed effects regression for the outcome variables of interest are presented in Table 3 (full regression tables are available in the supplementary materials).

Regression coefficients suggest that moving from rural to non-Jakarta urban residence is not significantly associated with change in HDDS, traditional practices, and expenditure shares for allfoods except the non-rice staples group, which increased slightly but significantly (0.01; SE: 0.002; $p<0.001$). Conversely, moving to Jakarta is significantly associated with change in several outcomes: lower expenditure shares for rice (-0.06; SE:

0.01; p<0.001), cooking oils (-0.02; SE: 0.003; p<0.001) and self-produced food (-0.07; SE: 0.02; p<0.001); and higher shares of ready-made foods (0.13; SE: 0.04; p<0.001).

A final note concerns the magnitude of the effects observed. As noted throughout this section, regression coefficients and overall R-squared values are consistently low for all the dependent variables considered, in both OLS and FE models. We ascribe this to the fact that we study a substantial time period, which makes it likely that the explanatory variables considered are only but few of many potential determinants of change.

Table 3. Results of the individual fixed effects regression of urban residence and different food outcome variables

5. Discussion

Our results suggest an overall increase in dietary diversity over time, and some changes in food acquisitions consistent with the nutrition transition theory, such as lower expenditure shares for staple foods, and higher shares for meat, eggs, milk, packaged and prepared foods, soft drinks and cooking oils. However, other shifts predicted by the nutrition transition have not materialised. Expenditure shares for foods associated with the local traditional diet, such as fish and vegetables, have not decreased; shares for other traditional foods such as non-rice staples showed little change; and the traditional practices studied—food self-production and transfers—have both increased over time. In addition, results suggest that most changes have occurred at a similar pace in rural and urban areas. Fixed effect models offer some evidence that moving to Jakarta is associated with significant changes in food expenditures for some foods, consistent with the nutrition transition hypothesis, but we find no evidence that moving to other urban areas is associated with change. Overall, this suggests that many changes occurred may not be attributable to urban living alone.

Our results offer some support to the hypothesis that changes in dietary preferences are context-specific rather than universal (Kearney, 2010). Also, our results indicate some resilience of local food cultures in Indonesia, as evidenced by the retention, for urban and rural residents alike, of many foods associated with the local diet, in spite of increased availability of other products. This pattern is consistent with that observed in LMICs elsewhere, e.g. in Colombia (Dufour, Bender and Reina (2015) and the Caribbean region (Paddock, 2017). Our results are also consistent with prior findings for Indonesia (Lipoeto et al. 2004) suggesting that, while expenditures for animal and ready-made foods have increased, there is overall little change in food preferences, with larger increases in expenditures for traditional foods such as soy products and fish, over foods such as meat, milk and eggs.

Regarding the second question addressed by this study—whether urban residence is a significant predictor of change in food preferences—our findings show some evidence that urban households do present some characteristics usually associated, in the nutrition transition hypothesis, with urban living (Popkin 1999; Popkin, 2013). These include higher HDDS, reflecting higher diversity in foods consumed, lower expenditure shares for staples, smaller shares of self-produced food, and higher consumption of packaged foods, some animal products, ready-made meals and soft drinks. However, the interaction between time trend and urban residence shows some evidence that change, over the time period considered, may have in fact occurred at a slower pace in urban areas compared to rural ones, for HDDS and some specific items (e.g. eggs, milk, packaged foods). While significant, most regression coefficients are very small in this sense; this suggests that, over the past two decades, dietary patterns in rural areas of Indonesia may have undergone comparatively more substantial change, or at least that the pace of change has not differed substantially between rural and urban areas. Consequently, findings suggest that traditional distinctions between urban and rural diet types may be blurring, as observed elsewhere in Southeast Asia (IIED, 2016). Moreover, when employing individual fixed effect regression to isolate the effect of change in residence from individual-level confounder, the overall lack of significance of urban residence as a predictor of change suggests that some of the associations between urban residence and food expenditures observed in the OLS models may reflect compositional differences or other changes that have occurred parallel to urbanisation.

On the other hand, we find some evidence that moving specifically to Jakarta is associated with transition towards less traditional diets. Jakarta, Indonesia's only megacity, has shown one of the highest growth rates among urban areas in the region over the past two decades, and presents very high density levels compared to both cities within Indonesia and Southeast Asia (World Bank, 2016). As a result, its food system is likely to have changed faster, and to differ substantially from those of smaller urban centres. Shifts in preferences for some foods, and in traditional practices observed for those in the sample who moved to Jakarta are significant, and in line with associations made between urban living and diets in the nutrition transition hypothesis (Popkin, 1999; Popkin, 2013). These include lower expenditures for rice; higher expenditures for ready-made foods; and lower shares of food self-produced. This suggests that urban living may not be *per se* a determining factor in explaining dietary change, but, rather, that different types of urban areas can have different effects on food preferences. Similarly, findings for the traditional practices studied—self-production and sharing—show that urban residence (outside Jakarta) is not a significant predictor of their retention over time or lack thereof. This may in turn reflect the presence, in Indonesia, of certain urban forms that are conducive to maintaining such practices, for example through higher land availability and less clearly-marked rural/urban boundaries. The existence in Indonesia—and more broadly in Southeast Asia—of such areas, often termed *desa-kota* (Indonesian for village-city), has long been noted (Silver, 2007; Rimmer and Dick, 2009), and indeed the appropriateness of the urban/rural dichotomy for such regions has been increasingly challenged, including in relation to the production and consumption of food, which is often maintained in such areas to support livelihoods and meet cultural needs associated with traditional foods (Lerner *et al.*, 2011).

Study limitations

A first limitation of this study is the assumption that expenditure estimates can represent changes in food preferences. Based on expenditure data, it is impossible to discern what amount of foods bought is actually consumed (for example, versus thrown away or accumulated as stock). However, since our study focuses on time trends within households, we argue that changes in acquisition and expenditure shares will reflect, to some extent, broad changes in food preferences within those households. Second, IFLS lacks information on food sources, and on the motivations behind self-production and transfers. Such information would help to better interpret drivers of change and drivers of retention of traditional food practices. A third limitation is sample attrition and exclusion of respondents due to missing information on variables of interest. IFLS successfully minimised attrition across waves, achieving very high re-contact rates (between 92-95%) for baseline households (see Thomas *et al.*, 2012, for an exhaustive discussion). However, while attrition in IFLS is low, sample selectivity bias may still be present. Statistically significant differences exist between those who were and were not re-contacted, with the latter likely to be more educated, young, single and urban (Thomas *et al.*, 2012). Similarly, our decision to exclude 1,875 individuals (15.7% of the panel sample) due to missing data represents a limitation, as it is impossible to determine with certainty whether these individuals systematically differ from those included in the study. Finally, while the use of fixed effect models to examine the impact of exposure to urban environments on food preferences enabled us to control for time-invariant confounders, the choice to move between urban and rural areas is not random, and may reflect changes in other aspects of the household environment, such as the start of a new job or family. While we control for variables capturing some of these changes, there may be still residual confounding not captured in our models.

Conclusion

This article has examined change in food acquisitions across 13 Indonesian provinces between 1993 and 2015, using panel data and looking at urban residence as the key predictor of change. Results suggest that, while there have been some changes in food acquisitions consistent with the nutrition transition hypothesis, preference for many foods that are part of the traditional Indonesian diet remains dominant. Moreover, with the exception of the megacity of Jakarta, trends observed are similar across urban and rural areas, with rural residents actually showing faster pace of change for some foods. Our findings highlight the need to further investigate, qualitatively, the reasons behind dietary choices in urban and rural Indonesia; the effect of specific urban areas and city types on food choices and practices; and the motivations behind retention of traditional food practices. Furthermore, findings underscore the need to reconsider the generalisability of the nutrition transition hypothesis, as predicted shifts in food consumption have only partly occurred; and to question the role attributed to urban food environments as drivers of change, as an urban effect on diets in Indonesia is observed only in the very specific context of its megacity capital, and as there is some evidence that, over the time period considered, change has occurred at slower rates in urban areas compared to rural ones.

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Table 1. Panel descriptive statistics (N=8,486).

	1993	1997	2000	2007	2015
Sex					
Male			44.3		
Female			55.7		
Age	41.1	45.1	48.1	53.2	59.1
Household size	4.9	5.5	6.1	6.8	7.6
Marital status					
Married	90.5	85.5	86.7	70.3	57.6
Other	9.5	14.5	13.3	29.7	42.4
Employment status					
Employed	68.3	68.1	76.8	53.9	51.9
Unemployed	31.7	31.9	23.2	46.1	48.1
Education					
No formal education	84	79.9	21.2	31.9	38.2
Primary	12.3	14.9	52.3	44.9	40.4
Secondary	3.2	4.5	22.4	18.9	16.9
Tertiary	0.5	0.7	4.1	4.3	4.5
Urban/rural residence					
Rural	57.6	58.2	57.8	52.6	46.4
Urban (non-Jakarta)	35.5	35.3	35.9	41.2	47.3
Urban (Jakarta)	6.9	6.5	6.3	6.2	6.2
Rural-urban movers	-	72	160	600	590
Urban-rural movers	-	124	128	157	69
Total	-	196	288	757	659

Table 2. Results of the OLS regression of urban residence, year trend, and outcome variables.

	HDDS	Rice	Non-rice staples	Vegetables	Fruits	Meat	Fish	Eggs	Milk	Butter	Cooking oils	Soft drinks	Packaged foods	Prepared foods	Food self-production	Food transfers value (IDR)
Year	0.1***	-0.001***	-0.0004***	0.0003	0.001***	0.001***	0.0002	0.0004***	0.001***	0.00000	0.001***	0.0002***	0.001***	0.003***	0.004***	708.2***
	(0.01)	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0001)	(0.0002)	(0.0003)	(56.3)
Urban residence (non-Jakarta)	0.65***	-0.05***	-0.01***	0.004**	0.01***	0.01***	-0.01***	0.004***	0.01***	0.001***	-0.01***	0.002***	0.01***	0.04***	-0.1***	332.3
	(0.1)	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.0001)	(0.001)	(0.0003)	(0.001)	(0.002)	(0.004)	(488.5)
Urban residence (Jakarta)	1.3***	-0.1***	-0.01***	0.01**	0.02***	0.03***	-0.03***	0.003	0.02***	0.002***	-0.01***	0.01***	0.02***	0.07***	-0.13***	1963.9
	(0.2)	(0.01)	(0.003)	(0.003)	(0.002)	(0.004)	(0.003)	(0.001)	(0.002)	(0.0003)	(0.001)	(0.001)	(0.003)	(0.01)	(0.01)	(1059.7)
Urban residence (non-Jakarta)# year	-0.04***	0.003***	0.001***	-0.001***	-0.0003	-0.001***	-0.001***	-0.0004***	-0.001***	-0.0001***	-0.0001	-0.0001	-0.001***	0.0005	0.001	123.8
	(0.01)	(0.0003)	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0001)	(0.0003)	(0.0004)	(83.9)
Urban residence (Jakarta) #year	-0.07***	0.003***	0.001***	-0.003***	-0.001**	-0.001	-0.0004	-0.0001	-0.001***	-0.0001*	-0.0004**	0.00000	-0.001***	0.003***	0.001	273.7
	(0.02)	(0.0005)	(0.0001)	(0.0004)	(0.0003)	(0.0004)	(0.0002)	(0.0001)	(0.0002)	(0.0000)	(0.0001)	(0.0001)	(0.0003)	(0.001)	(0.001)	(154.1)
Constant	-187.5***	2.8***	0.8***	-0.4	-1.2***	-1.4***	-0.3	-0.7***	-1.1***	-0.00156	-0.98976***	-0.3***	-1.4***	-5.1***	-7.3***	-1412592.2***
	(14.6)	(0.5)	(0.2)	(0.2)	(0.2)	(0.3)	(0.2)	(0.1)	(0.1)	(0.0186)	(0.1205)	(0.04)	(0.2)	(0.4)	(0.6)	(112132.7)
R-sqr	0.09	0.07	0.02	0.01	0.03	0.04	0.02	0.01	0.04	0.010	0.018	0.02	0.02	0.1	0.1	0.04
N	30205	38691	38691	38691	38691	38691	38691	38691	38691	38691	38691	38691	30205	30205	38691	38691

Notes: Standard errors in parentheses **p<0.05; ***p<0.01.

Table 3. Results of the individual fixed effects regression of urban residence and outcome variables.

	HDDS	Rice	Non-rice staples	Vegetables	Fruits	Meat	Fish	Eggs	Milk	Butter	Cooking oil	Soft drinks	Packaged foods	Prepared foods	Food self-production	Food transfers value (IDR)
Urban residence (non-Jakarta)	0.3	-0.007	0.01***	0.007	-0.002	0.001	-0.006	-0.001	0.001	-0.00001	-0.002	0.0005	0.005	-0.003	-0.01	-284.4
	(0.15)	(0.005)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.0002)	(0.001)	(0.001)	(0.002)	(0.004)	(0.01)	(1218.4)
Urban residence (Jakarta)	0.69	-0.06***	-0.007	0.02	0.003	0.006	-0.01	-0.01	0.001	-0.001	-0.02***	0.003	0.02	0.13***	-0.07***	1771.4
	(0.63)	(0.01)	(0.003)	(0.01)	(0.01)	(0.01)	(0.006)	(0.003)	(0.006)	(0.001)	(0.003)	(0.002)	(0.01)	(0.04)	(0.02)	(1453.6)
Constant	5.0***	0.24***	0.03***	0.1***	0.05***	0.05***	0.07***	0.03***	-0.02***	0.001	0.05***	0.002	0.035***	0.19***	0.27***	-1798.5
	(0.44)	(0.01)	(0.005)	(0.007)	(0.005)	(0.007)	(0.005)	(0.003)	(0.005)	(0.001)	(0.003)	(0.001)	(0.01)	(0.02)	(0.02)	(2707.7)
R-sqr	0.042	0.023	0.004	0.012	0.007	0.007	0.003	0.004	0.014	0.002	0.033	0.006	0.019	0.063	0.053	0.039
N	33944	42430	42430	42430	42430	42430	42430	42430	42430	42430	42430	42430	33944	33944	42430	42430

Notes: Standard errors in parentheses. **p<0.05; ***p<0.01.

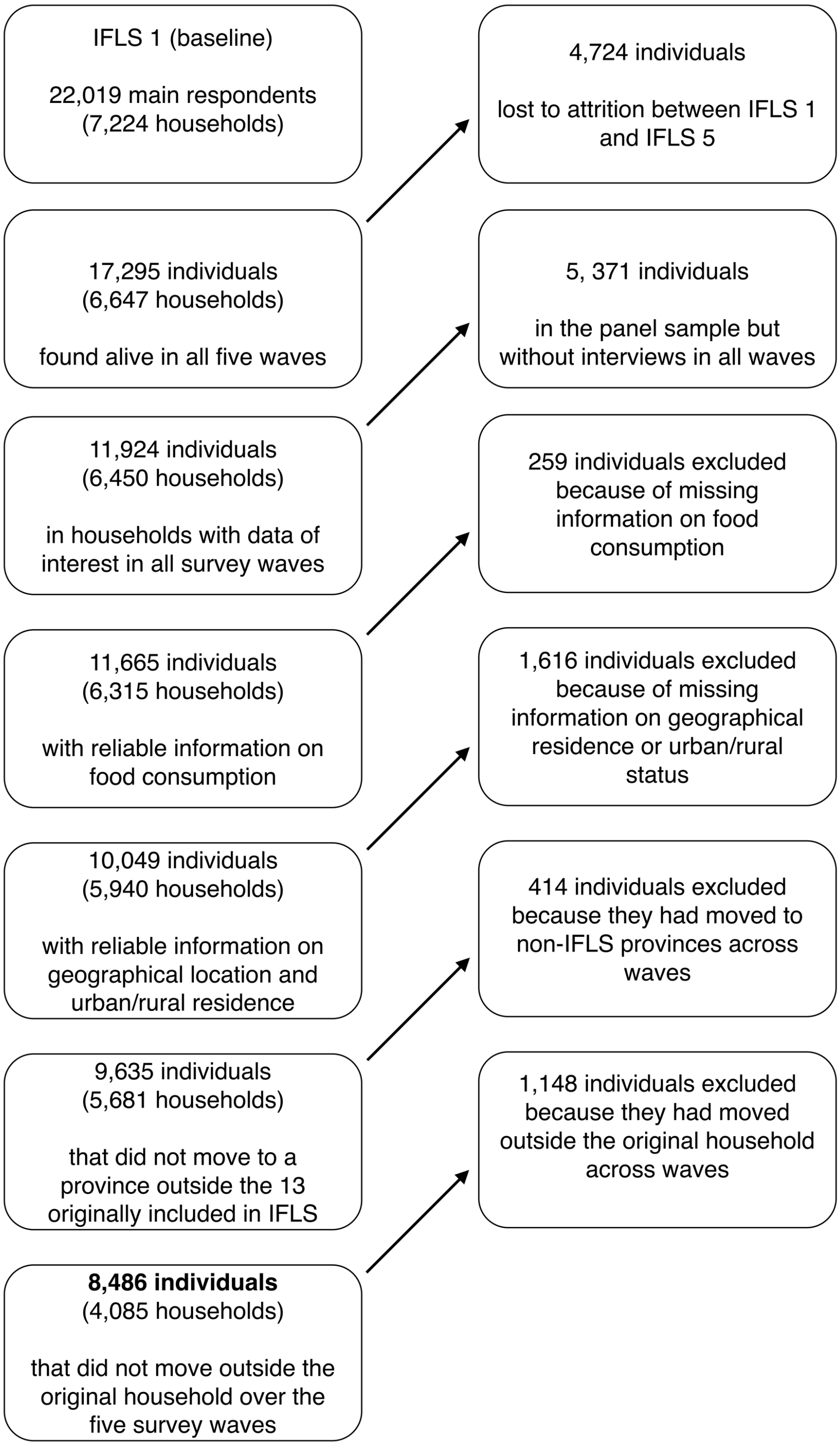


Figure 1. Flow chart of sample selection

Figure 2. Average household dietary diversity Score (HDDS) and unadjusted shares of expenditure by food groups (N=8,486).

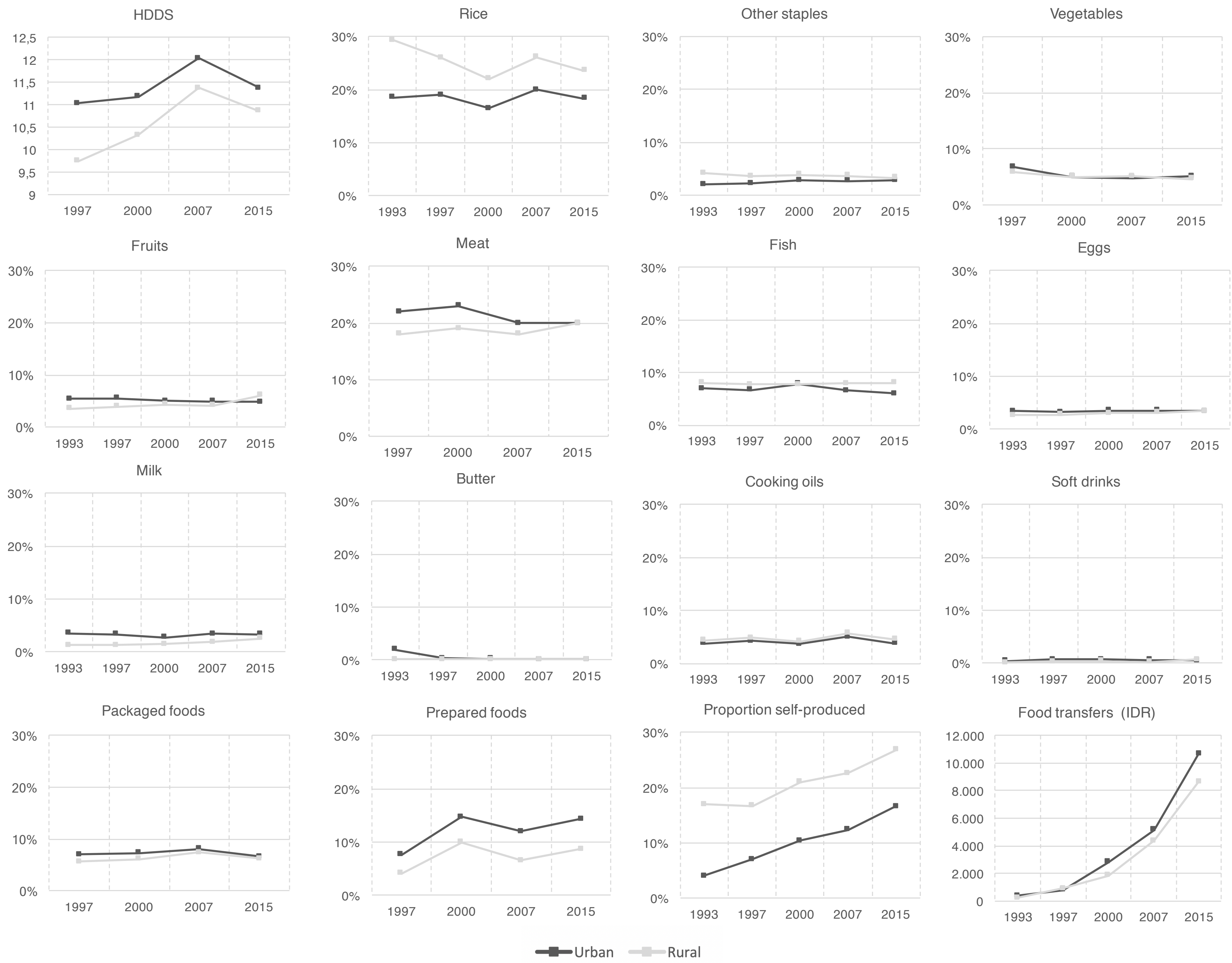
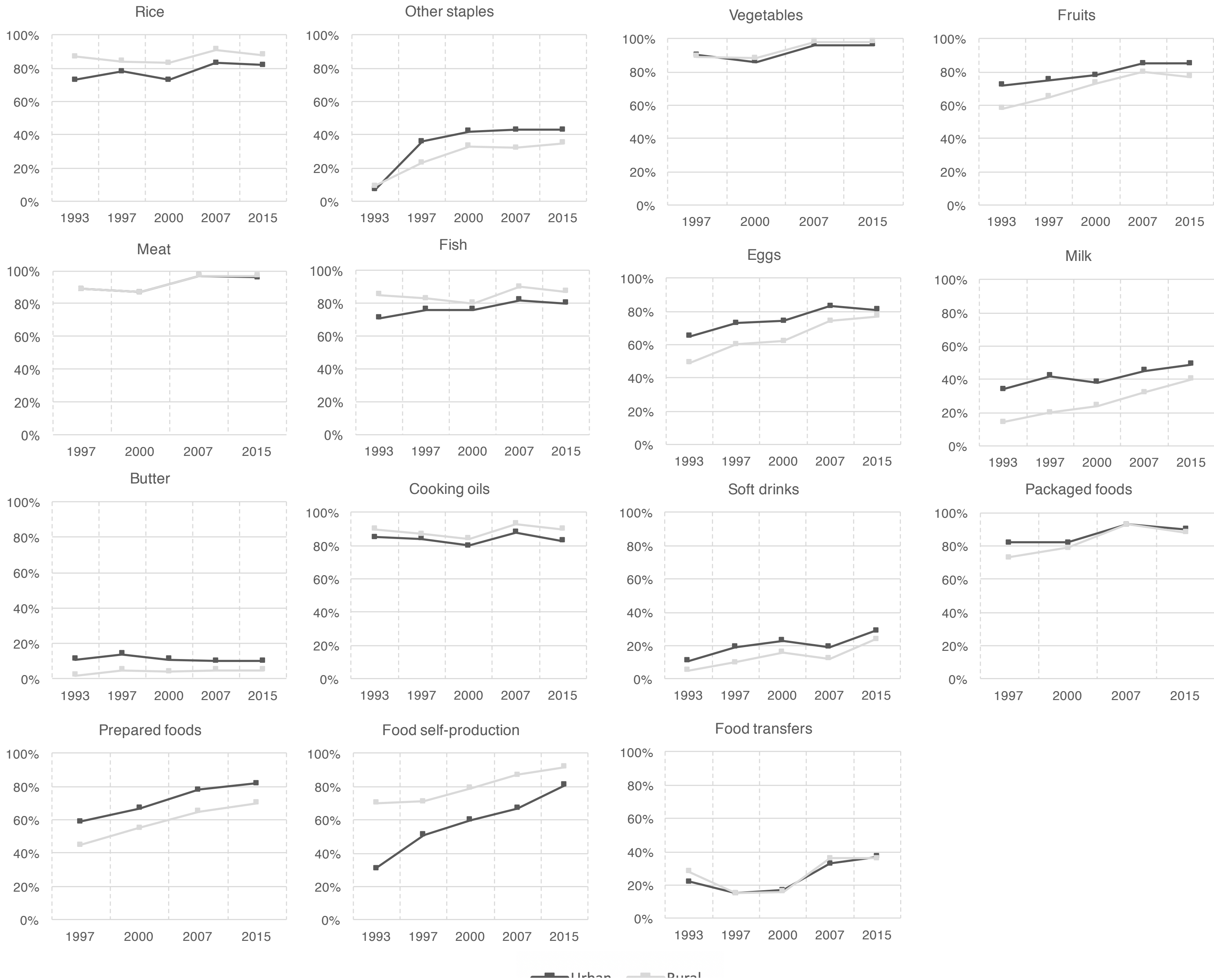


Figure 3. Confounder-adjusted proportions of individuals reporting purchase and/or self-production of different foods (N=8,486).



Supplementary Materials

OLS Full Regression Table

	HDDS	Rice	Non-rice staples	Vegetables	Fruits	Meat	Fish	Eggs	Milk	Butter	Cooking oils	Soft drinks	Packaged foods	Prepared foods	Food self-production	Food transfers
Year	0.099***	-0.001***	-0.0004***	0.0003*	0.001***	0.001***	0.0002	0.0004***	0.001***	0.00000	0.001***	0.0002***	0.001***	0.003***	0.004***	708.2***
	(0.007)	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0001)	(0.0002)	(0.0003)	(56.3)
Urban residence (non-Jakarta)	0.65***	-0.05***	-0.01***	0.004**	0.01***	0.01***	-0.01***	0.004***	0.01***	0.001***	-0.01***	0.002***	0.01***	0.04***	-0.1***	332.3
	(0.09)	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.0001)	(0.001)	(0.0003)	(0.001)	(0.002)	(0.004)	(488.5)
Urban residence (Jakarta)	1.3***	-0.11***	-0.01***	0.01**	0.02***	0.03***	-0.03***	0.003*	0.02***	0.002***	-0.01***	0.01***	0.02***	0.07***	-0.13***	1963.9
	(0.19)	(0.005)	(0.003)	(0.003)	(0.002)	(0.004)	(0.003)	(0.001)	(0.002)	(0.0003)	(0.001)	(0.001)	(0.003)	(0.01)	(0.01)	(1059.7)
Urban residence (non-Jakarta)#year	-0.04***	0.003***	0.001***	-0.001***	-0.0003*	-0.001***	-0.001***	-0.0004***	-0.001***	-0.0001***	-0.00011	-0.0001	-0.001***	0.0005	0.001	123.8
	(0.01)	(0.0003)	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0001)	(0.0003)	(0.0004)	(83.9)
Urban residence (Jakarta)#year	-0.07***	0.003***	0.001***	-0.003***	-0.00075**	-0.001	-0.0004	-0.0001	-0.001***	-0.0001*	-0.0004**	0.00000	-0.001***	0.003***	0.001	273.7
	(0.02)	(0.0005)	(0.0001)	(0.0004)	(0.0003)	(0.0004)	(0.0002)	(0.0001)	(0.0002)	(0.0000)	(0.0001)	(0.0001)	(0.0003)	(0.001)	(0.001)	(154.1)
Sex	0.36633***	0.00309*	0.00251***	0.003***	0.00124**	0.00274***	-0.00030	0.00110***	0.00020	0.00008	0.00195***	-0.00036**	-0.00020	-0.01***	0.00941***	1985.06***
	(0.0433)	(0.0014)	(0.0005)	(0.0007)	(0.0004)	(0.0007)	(0.0007)	(0.0003)	(0.0004)	(0.0001)	(0.0003)	(0.0001)	(0.0005)	(0.002)	(0.0017)	(236.9636)
Age	-0.04691***	0.00009	0.00014**	0.00008	-0.00018***	-0.00007	-0.00057***	-0.00012***	-0.00020***	-0.00000	0.00006*	-0.00011***	-0.00051***	-0.001***	0.00141***	-30.68276*
	(0.0033)	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(13.2384)
Household size	0.41983***	0.01371***	0.00068	-0.00828***	-0.00433***	-0.00147	0.01106***	-0.00111	0.00261***	0.00009	-0.00375***	0.00009	-0.00234*	-0.02253***	-0.01955***	-338.70665
	(0.0780)	(0.0031)	(0.0010)	(0.0014)	(0.0009)	(0.0015)	(0.0017)	(0.0006)	(0.0008)	(0.0001)	(0.0006)	(0.0003)	(0.0010)	(0.0026)	(0.0040)	(426.4421)
Married	1.23357***	0.02284***	0.00500***	0.01092***	0.00334**	0.00985***	0.00611**	0.00191**	-0.00007	0.00011	0.00509***	-0.00054	-0.00092	-0.03207***	0.00248	1158.17410
	(0.0982)	(0.0035)	(0.0012)	(0.0017)	(0.0011)	(0.0018)	(0.0019)	(0.0007)	(0.0010)	(0.0001)	(0.0008)	(0.0003)	(0.0013)	(0.0035)	(0.0043)	(595.0446)
Employed	0.25404***	0.00396	0.00320***	0.00269*	0.00178*	-0.00338**	-0.00540***	0.00060	-0.00241***	-0.00018	0.00233***	0.00067**	-0.00083	0.00127	0.01331***	-225.14145
	(0.0625)	(0.0023)	(0.0008)	(0.0011)	(0.0007)	(0.0012)	(0.0012)	(0.0005)	(0.0007)	(0.0001)	(0.0005)	(0.0002)	(0.0009)	(0.0020)	(0.0026)	(459.7000)
Primary education	0.50193***	-0.01100***	0.00143	0.00154	-0.00027	0.00313*	0.00127	0.00307***	-0.00100	-0.00030*	0.00013	0.00013	0.00521***	0.00228	0.00902**	-873.94190*
	(0.0703)	(0.0027)	(0.0010)	(0.0013)	(0.0008)	(0.0013)	(0.0014)	(0.0006)	(0.0007)	(0.0001)	(0.0006)	(0.0002)	(0.0010)	(0.0019)	(0.0033)	(359.3697)
Secondary education	1.34899***	-0.05642***	-0.00067	-0.01051***	0.00838***	0.02893***	0.01045***	0.00710***	0.01055***	0.00068***	-0.00190*	0.00164***	0.00980***	0.01790***	-0.00043	3173.51***
	(0.0970)	(0.0036)	(0.0011)	(0.0017)	(0.0011)	(0.0020)	(0.0020)	(0.0008)	(0.0012)	(0.0002)	(0.0008)	(0.0003)	(0.0014)	(0.0031)	(0.0041)	(609.2807)
Tertiary education	1.98226***	-0.10143***	-0.00260	-0.02185***	0.02560***	0.04722***	0.01134**	0.00852***	0.01900***	0.00155***	-0.00936***	0.00403***	0.01880***	0.05260***	-0.01309	10879.49***
	(0.1649)	(0.0054)	(0.0014)	(0.0026)	(0.0024)	(0.0038)	(0.0038)	(0.0014)	(0.0024)	(0.0003)	(0.0013)	(0.0008)	(0.0028)	(0.0071)	(0.0071)	(1763.1425)
Constant	-187.5***	2.8***	0.8***	-0.4	-1.2***	-1.4***	-0.3	-0.7***	-1.1***	-0.00156	-0.98976***	-0.3***	-1.4***	-5.1***	-7.3***	-1412592.2***
	(14.6)	(0.5)	(0.2)	(0.2)	(0.2)	(0.3)	(0.2)	(0.1)	(0.1)	(0.0186)	(0.1205)	(0.04)	(0.2)	(0.4)	(0.6)	(112132.7)
R-sqr	0.09	0.07	0.02	0.01	0.03	0.04	0.02	0.01	0.04	0.010	0.018	0.02	0.02	0.1	0.1	0.04
N	30205	38691	38691	38691	38691	38691	38691	38691	38691	38691	38691	38691	30205	30205	38691	38691

Notes: Standard errors in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Fixed effects Full Regression Table

	HDDS	Rice	Non-rice staples	Vegetables	Fruits	Meat	Fish	Eggs	Milk	Butter	Cooking oil	Soft drinks	Packaged foods	Prepared foods	Food self-production	Food transfers
Urban residence (non-Jakarta)	0.28261	-0.00683	0.00808***	0.00673*	-0.00190	0.00110	-0.00633*	-0.00089	0.00074	-0.00001	-0.00196	0.00054	0.00501*	-0.00356	-0.00661	-284.43200
	(0.1450)	(0.0053)	(0.0020)	(0.0027)	(0.0018)	(0.0028)	(0.0026)	(0.0017)	(0.0020)	(0.0002)	(0.0014)	(0.0006)	(0.0023)	(0.0043)	(0.0062)	(1218.4568)
Urban residence (Jakarta)	0.68777	-0.05751***	-0.00691*	0.02246	0.00280	0.00563	-0.01036	-0.00739*	0.00107	-0.00139*	-0.01577***	0.00326	0.01918*	0.13278***	-0.06612***	1771.39470
	(0.6345)	(0.0106)	(0.0033)	(0.0138)	(0.0061)	(0.0093)	(0.0061)	(0.0032)	(0.0056)	(0.0007)	(0.0034)	(0.0020)	(0.0075)	(0.0384)	(0.0195)	(1453.5905)
1997	-	-0.01629***	-0.00257*	0.01445***	0.00313*	0.01264***	-0.00358*	-0.00090	-0.00381***	0.00037	0.00264***	0.00212***	-	-	0.01512***	405.35289
	-	(0.0033)	(0.0012)	(0.0020)	(0.0013)	(0.0017)	(0.0014)	(0.0008)	(0.0010)	(0.0002)	(0.0008)	(0.0004)	-	-	(0.0033)	(367.4457)
2000	0.16212	-0.05714***	-0.00127	0.00807***	0.00461**	0.00532**	-0.00096	0.00172	-0.00548***	0.00019	-0.00409***	0.00278***	0.00519***	0.02680***	0.05480***	-467.36362
	(0.0904)	(0.0041)	(0.0015)	(0.0023)	(0.0015)	(0.0020)	(0.0018)	(0.0010)	(0.0012)	(0.0002)	(0.0009)	(0.0004)	(0.0013)	(0.0025)	(0.0046)	(467.2789)
2007	0.95109***	-0.01858***	-0.00247	0.00692**	0.00380*	0.00838***	-0.00423*	0.00245*	-0.00321*	0.00029	0.01547***	0.00143***	0.01321***	0.04672***	0.07508***	5324.40269***
	(0.1011)	(0.0045)	(0.0017)	(0.0025)	(0.0016)	(0.0023)	(0.0019)	(0.0011)	(0.0014)	(0.0003)	(0.0011)	(0.0004)	(0.0015)	(0.0032)	(0.0053)	(750.4673)
2015	0.15902	-0.03957***	-0.00419*	-0.00100	0.01339***	0.01237***	-0.00567*	0.00375**	-0.00273	-0.00015	0.00355**	0.00321***	-0.00311	0.07387***	0.11697***	13737.77186***
	(0.1184)	(0.0052)	(0.0019)	(0.0028)	(0.0019)	(0.0028)	(0.0022)	(0.0012)	(0.0017)	(0.0003)	(0.0012)	(0.0005)	(0.0018)	(0.0041)	(0.0062)	(1209.7956)
Household size	2.04289***	-0.00064	-0.00297	-0.00517	-0.00318	0.00186	0.00200	0.00130	0.01900***	0.00002	-0.00446***	0.00046	0.01294***	-0.04776***	-0.05594***	1039.33280
	(0.1740)	(0.0054)	(0.0021)	(0.0030)	(0.0020)	(0.0030)	(0.0023)	(0.0012)	(0.0020)	(0.0003)	(0.0013)	(0.0006)	(0.0027)	(0.0066)	(0.0067)	(1210.1394)
Married	0.38484**	0.02021***	0.00061	0.00668***	-0.00265	0.00292	0.00528**	-0.00004	-0.00121	0.00012	0.00256**	-0.00080	-0.00670***	-0.04140***	-0.02122***	585.37179
	(0.1182)	(0.0040)	(0.0014)	(0.0020)	(0.0014)	(0.0021)	(0.0017)	(0.0009)	(0.0014)	(0.0002)	(0.0010)	(0.0005)	(0.0018)	(0.0046)	(0.0052)	(990.7260)
Employed	0.19055**	-0.00529*	0.00078	0.00288*	0.00136	-0.00383**	-0.00015	0.00111*	-0.00161*	0.00004	0.00201***	0.00086***	0.00107	0.00037	0.00138	-895.01108
	(0.0644)	(0.0024)	(0.0008)	(0.0012)	(0.0008)	(0.0013)	(0.0010)	(0.0005)	(0.0008)	(0.0001)	(0.0006)	(0.0003)	(0.0011)	(0.0022)	(0.0027)	(638.5698)
Primary education	-0.01386	0.00207	0.00365***	-0.00069	-0.00129	0.00586***	0.00222	0.00123	0.00076	-0.00023	-0.00051	-0.00017	-0.00321*	-0.01265***	0.00031	1352.35814**
	(0.0861)	(0.0030)	(0.0011)	(0.0016)	(0.0010)	(0.0015)	(0.0013)	(0.0007)	(0.0009)	(0.0002)	(0.0007)	(0.0003)	(0.0013)	(0.0027)	(0.0035)	(454.2142)
Secondary education	0.07319	0.02532***	0.00705***	-0.01099***	-0.00545***	0.00627**	0.00452*	-0.00057	-0.00573***	-0.00094**	0.00182	-0.00139**	-0.00434*	-0.00684	0.00345	4381.11354***
	(0.1204)	(0.0040)	(0.0014)	(0.0022)	(0.0016)	(0.0023)	(0.0018)	(0.0009)	(0.0016)	(0.0003)	(0.0010)	(0.0005)	(0.0018)	(0.0040)	(0.0043)	(818.3976)
Tertiary education	-0.28473	0.04132***	0.00784***	-0.01230***	0.00359	-0.00068	-0.00210	-0.00402*	-0.01814***	-0.00101*	-0.00027	-0.00155	-0.01045**	0.00344	-0.00771	9920.81877***
	(0.2013)	(0.0067)	(0.0020)	(0.0036)	(0.0029)	(0.0047)	(0.0038)	(0.0019)	(0.0038)	(0.0004)	(0.0016)	(0.0011)	(0.0040)	(0.0078)	(0.0072)	(2043.6866)
Constant	4.97572***	0.23946***	0.03469***	0.10233***	0.05316***	0.04653***	0.07038***	0.02732***	-0.01614***	0.00154*	0.04862***	0.00191	0.03499***	0.19597***	0.26678***	-1798.48972
	(0.4365)	(0.0126)	(0.0049)	(0.0070)	(0.0048)	(0.0069)	(0.0054)	(0.0030)	(0.0047)	(0.0006)	(0.0031)	(0.0015)	(0.0066)	(0.0168)	(0.0156)	(2707.7074)
R-sqr	0.042	0.023	0.004	0.012	0.007	0.007	0.003	0.004	0.014	0.002	0.033	0.006	0.019	0.063	0.053	0.039
N	33944	42430	42430	42430	42430	42430	42430	42430	42430	42430	42430	42430	33944	33944	42430	42430

Notes: Standard errors in parentheses. *p<0.1; **p<0.05; ***p<0.01.